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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XD256

Takes of Marine Mammals Incidental to Specified Activities; Low-Energy Marine Geophysical Survey in the Scotia Sea and South Atlantic Ocean, September to October 2014

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an Incidental Harassment Authorization (IHA).

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA), notification is hereby given that NMFS has issued an IHA to the National Science Foundation (NSF) Division of Polar Programs, and Antarctic Support Contract (ASC) on behalf of two research institutions, University of Texas at Austin and University of Memphis, to take marine mammals, by Level B harassment, incidental to conducting a low-energy marine geophysical (seismic) survey in the Scotia Sea and South Atlantic Ocean, September to October 2014.

DATES: Effective September 20, 2014, to December 1, 2014.

ADDRESSES: A copy of the IHA and the application are available by writing Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910 or by telephone the contacts listed below (see FOR FURTHER INFORMATION CONTACT).

An electronic copy of the IHA application containing a list of the references used in this document may be obtained by writing to the address specified above, telephoning the contact listed here (see FOR FURTHER INFORMATION CONTACT) or visiting the Internet at:

http://www.nmfs.noaa.gov/pr/permits/incidental/. Documents cited in this notice, including the IHA application, may also be viewed by appointment, during regular business hours, at the aforementioned address.

An "Environmental Assessment on the Issuance of an Incidental Harassment Authorization to the National Science Foundation and Antarctic Support Contract to Take Marine Mammals by Harassment Incidental to a Low-energy Marine Geophysical Survey in the Scotia Sea and South Atlantic Ocean, September to October 2014" was prepared by NMFS. NMFS also issued a Biological Opinion under section 7 of the Endangered Species Act (ESA) to evaluate the effects of the low-energy seismic survey and IHA on marine species listed as threatened and endangered. The NMFS Biological Opinion is available online at: http://www.nmfs.noaa.gov/pr/consultations/opinions.htm.

FOR FURTHER INFORMATION CONTACT: Howard Goldstein or Jolie Harrison, Office of Protected Resources, NMFS, 301-427-8401.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA, (16 U.S.C. 1361 et seq.) direct the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact

on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. NMFS has defined "negligible impact" in 50 CFR 216.103 as "…an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Summary of Request

On April 15, 2014, NMFS received an application from NSF and ASC requesting that NMFS issue an IHA for the take, by Level B harassment only, of small numbers of marine mammals incidental to conducting a low-energy marine seismic survey in the Exclusive Economic Zone (EEZ) of the South Georgia and South Sandwich Islands and International Waters (i.e., high seas) in the Scotia Sea and southern Atlantic Ocean during September to October 2014.

The research will be conducted by two research institutions: University of Texas at Austin and University of Memphis. NSF and ASC plan to use one source vessel, the RVIB Nathaniel B. Palmer (Palmer), and a seismic airgun array and hydrophone streamer to collect seismic data in the Scotia Sea and southern Atlantic Ocean. The vessel will be operated by ASC,

which operates the United States Antarctic Program (USAP) under contract with NSF. In support of the USAP, NSF and ASC plan to use conventional low-energy, seismic methodology to perform marine-based studies in the Scotia Sea, including evaluation of lithosphere adjacent to and beneath the Scotia Sea and southern Atlantic Ocean in two areas, the South Georgia micro-continent and the seafloor of the eastern portion of the central Scotia Sea (see Figures 1 and 2 of the IHA application). In addition to the planned operations of the seismic airgun array and hydrophone streamer, NSF and ASC intend to operate a single-beam echosounder, multi-beam echosounder, acoustic Doppler current profiler (ADCP), and sub-bottom profiler continuously throughout the survey. NMFS published a notice making preliminary determinations and proposing to issue an IHA on August 5, 2014 (79 FR 45592). The notice initiated a 30-day public comment period.

Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array may have the potential to cause behavioral disturbance for marine mammals in the survey area. This is the principal means of marine mammal taking associated with these activities, and NSF and ASC have requested an authorization to take 26 species of marine mammals by Level B harassment. Take is not expected to result from the use of the single-beam echosounder, multi-beam echosounder, ADCP, and sub-bottom profiler, as the brief exposure of marine mammals to one pulse, or small numbers of signals, to be generated by these instruments in this particular case is not likely to result in the harassment of marine mammals. Also, NMFS does not expect take to result from collision with the source vessel because it is a single vessel moving at a relatively slow, constant cruise speed of 5 knots ([kts]; 9.3 kilometers per hour [km/hr]; 5.8 miles per hour [mph]) during seismic acquisition within the survey, for a relatively short period of time (approximately 30 operational days). It is likely that any marine mammal

will be able to avoid the vessel.

Description of the Specified Activity

Overview

NSF and ASC plans to use one source vessel, the Palmer, a two GI airgun array and one hydrophone streamer to conduct the conventional seismic survey as part of the NSF-funded research project "Role of Central Scotia Sea Floor and North Scotia Ridge in the Onset and Development of the Antarctic Circumpolar Current." In addition to the airguns, NSF and ASC intend to conduct a bathymetric survey, dredge sampling, and geodetic measurements from the Palmer during the low-energy seismic survey.

Dates and Duration

The Palmer is expected to depart from Punta Arenas, Chile on approximately September 20, 2014 and arrive at Punta Arenas, Chile on approximately October 20, 2014. Research operations will be conducted over a span of 30 days, including to and from port. Some minor deviation from this schedule is possible, depending on logistics and weather (e.g., the cruise may depart earlier or be extended due to poor weather; or there could be additional days of seismic operations if collected data are deemed to be of substandard quality).

Specified Geographic Region

The planned project and survey sites are located in selected regions of the Scotia Sea (located northeast of the Antarctic Peninsula) and the southern Atlantic Ocean and focus on two areas: (1) between the central rise of the Scotia Sea and the East Scotia Sea, and (2) the far southern Atlantic Ocean immediately northeast of South Georgia towards the northeastern Georgia Rise (both encompassing the region between 53 to 58º South, and between 33 to 40º West) (see Figure 2 of the IHA application). The majority of the planned seismic survey will be

within the EEZ of the Government of the South Georgia and South Sandwich Islands (United Kingdom) and a limited portion of the seismic survey will be conducted in International Waters. Figure 3 of the IHA application illustrates the general bathymetry of the planned study area and the border of the existing South Georgia Maritime Zone. Water depths in the survey area exceed 1,000 m. There is limited information on the depths in the study area and therefore more detailed information on bathymetry is not available. The planned seismic survey will be within an area of approximately 3,953 km^2 (1,152.5 nmi^2). This estimate is based on the maximum number of kilometers for the seismic survey (2,950 km) multiplied by the predicted rms radii (m) based on modeling and empirical measurements (assuming 100% use of the two 105 in^3 GI airguns in greater than 1,000 m water depths), which was calculated to be 675 m (2,214.6 ft).

Detailed Description of the Specified Activity

NSF and ASC plans to conduct a low-energy seismic survey in the Scotia Sea and the southern Atlantic Ocean from September to October 2014. In addition to the low-energy seismic survey, scientific activities will include conducting a bathymetric profile survey of the seafloor using transducer-based instruments such as a multi-beam echosounder and sub-bottom profiler; collecting global positioning system (GPS) information through the temporary installation of three continuous Global Navigation Satellite Systems (cGNSS) on the South Georgia micro-continent; and collecting dredge sampling around the edges of seamounts or ocean floor with significant magnetic anomalies to determine the nature and age of bathymetric highs near the eastern edge of the central Scotia Sea. Water depths in the survey area are greater than 1,000 meters (m) (3,280.1 feet [ft]). The seismic survey is scheduled to occur for a total of approximately 325 hours over the course of the entire cruise, which will be for approximately 30 operational days in September to October 2014. The planned seismic survey will be conducted

during the day and night, and for up to 40 hours of continuous operations at a time. The operation hours and survey length will include equipment testing, ramp-up, line changes, and repeat coverage. The long transit time between port and the study site constrains how long the ship can be in the study area and effectively limits the maximum amount of time the airguns can operate. Some minor deviation from these dates will be possible, depending on logistics and weather.

The low-energy seismic survey of the Scotia Sea and southern Atlantic Ocean will involve conducting single channel seismic reflection profiling across the northern central Scotia Sea along two lines that cross the seismically active and apparently compressive boundary between the South Georgia micro-continent and the Northeast Georgia Rise. The targeted seismic survey will occur in the unexplored zones of elevated crust in the eastern central Scotia Sea and is designed to address several critical questions with respect to the tectonic nature of the northern and southern boundaries of the South Georgia micro-continent.

Opening of deep Southern Ocean gateways between Antarctica and South America and between Antarctica and Australia permitted complete circum-Antarctic circulation. This Antarctic Circumpolar Current is not well understood. The Antarctic Circumpolar Current may have been critical in the transition from a warm Earth in the early Cenozoic to the subsequent much cooler conditions that persist to the present day. Opening of Drake Passage and the west Scotia Sea likely broke the final barrier formed by the Andes of Tierra del Fuego and the "Antarctandes" of the Antarctic Peninsula. Once this deep gateway, usually referred to as the Drake Passage gateway, was created, the strong and persistent mid-latitude winds could generate one of the largest deep currents on Earth, at approximately 135 Sverdrup (a Sverdrup [Sv] is a measure of average flow rate in million cubic meters of water per second). This event is widely

believed to be closely associated in time with a major, abrupt drop in global temperatures and the rapid expansion of the Antarctic ice sheets at 33 to 34 Million Annus (Ma, i.e., million years from the present/before the current date), the Eocene-Oligocene boundary.

The events leading to the complete opening of the Drake Passage gateway are very poorly known. The uncertainty is due to the complex tectonic history of the Scotia Sea and its enclosing Scotia Ridge, the eastward-closing, locally emergent submarine ridge that joins the southernmost Andes to the Antarctic Peninsula and deflects the Antarctic Circumpolar Current through gaps in its northern limb. The critical keys to this problem are the enigmatic floor of the central Scotia Sea between the high relief South Georgia (approximately 3,000 m [9,842.5 ft]) and the lower South Orkney islands (approximately 1,200 m [3,937 ft]), emergent parts of micro-continental blocks on the North and South Scotia ridges respectively, and the North Scotia Ridge itself.

In 2008, an International Polar Year research program was conducted using the RVIB Nathaniel B. Palmer (Palmer) (Cruise NBP 0805) that was designed to elucidate the structure and history of this area to help provide the constraints necessary for understanding of the initiation of the critical Drake Passage – Scotia Sea gateway. Underway data and dredged samples produced unexpected results that led to a structurally different view of the central Scotia Sea and highlighted factors bearing on initiation of the Antarctic Circumpolar Current that had not been previously considered.

The results of this study of the central Scotia Sea are fragmentary due to the limited time available during Cruise NBP 0805. Therefore, the extent, geometry, and physiography of a submerged volcanic arc that may have delayed formation of a complete Antarctic Circumpolar Current until after the initiation of Antarctic glaciation are poorly defined, with direct dating

limited to a few sites. To remedy these deficiencies, thereby further elucidating the role of the central Scotia Sea in the onset and development of the Antarctic Circumpolar Current, the planned targeted surveying and dredging will determine likely arc constructs in the eastern central Scotia Sea. These will be combined with a survey of the margins of the South Georgia micro-continent and installation of three continuous GPS stations on South Georgia that will test the hypothesis regarding the evolution of the North Scotia Ridge, also an impediment to the present Antarctic Circumpolar Current. The Principal Investigators are Dr. Ian Dalziel and Dr. Lawrence Lawver of the University of Texas at Austin, and Dr. Robert Smalley of the University of Memphis.

The procedures to be used for the survey will be similar to those used during previous low-energy seismic surveys by NSF and will use conventional seismic methodology. The planned survey will involve one source vessel, the Palmer. NSF and ASC will deploy a two Sercel Generator Injector (GI) airgun array (each with a discharge volume of 105 in^3 [1,720 cm^3], in one string, with a total volume of 210 in^3 [3,441.3 cm^3]) as an energy source, at a tow depth of up to 3 to 4 m (9.8 to 13.1 ft) below the surface (more information on the airguns can be found in Appendix B of the IHA application). A third airgun will serve as a "hot spare" to be used as a back-up in the event that one of the two operating airguns malfunctions. The airguns in the array will be spaced approximately 3 m (9.8 ft) apart and 15 to 40 m (49.2 to 131.2 ft) astern of the vessel. The receiving system will consist of one or two 100 m (328.1 ft) long, 24-channel, solid-state hydrophone streamer(s) towed behind the vessel. Data acquisition is planned along a series of predetermined lines, all of which will be in water depths greater than 1,000 m. As the GI airguns are towed along the survey lines, the hydrophone streamer(s) will receive the returning acoustic signals and transfer the data to the onboard processing system. All planned

seismic data acquisition activities will be conducted by technicians provided by NSF and ASC, with onboard assistance by the scientists who have planned the study. The vessel will be self-contained, and the crew will live aboard the vessel for the entire cruise.

The weather and sea conditions will be closely monitored, including for conditions that could limit visibility. Pack ice is not anticipated to be encountered during the planned cruise; therefore, no icebreaking activities are expected. If situations are encountered which pose a risk to the equipment, impede data collection, or require the vessel to stop forward progress, the equipment will be shut-down and retrieved until conditions improve. In general, the airgun array and streamer(s) can be retrieved in less than 30 minutes.

The planned seismic survey (including equipment testing, start-up, line changes, repeat coverage of any areas, and equipment recovery) will consist of approximately 2,950 kilometers (km) (1,592.9 nautical miles [nmi]) of transect lines (including turns) in the survey area in the Scotia Sea and southern Atlantic Ocean (see Figures 1, 2, and 3 of the IHA application). In addition to the operation of the airgun array, a single-beam and multi-beam echosounder, ADCP, and a sub-bottom profiler will also likely be operated from the Palmer continuously throughout the cruise. There will be additional airgun operations associated with equipment testing, ramp-up, and possible line changes or repeat coverage of any areas where initial data quality is sub-standard. In NSF and ASC's estimated take calculations, 25% has been added for those additional operations.

Table 1. Planned low-energy seismic survey activities in the Scotia Sea and the southern Atlantic Ocean.

Survey Length (km)	Cumulative Duration (hr)[1]	Airgun Array Total Volume	Time Between Airgun Shots (Distance)	Streamer Length (m)
2,950 (1,592.9 nmi)	~325	2 x 105 in^3 (2 x 1,720 cm^3)	5 to 10 seconds (12.5 to 25 m or	100 (328.1 ft)

			41 to 82 ft)	

[1] Airgun operations are planned for no more than 40 continuous hours at a time.

NMFS outlined the purpose of the program in a previous notice for the proposed IHA (79 FR 45592, August 5, 2014). The activities to be conducted have not changed between the proposed IHA notice and this final notice announcing the issuance of the IHA. For a more detailed description of the authorized action, including vessel and acoustic source specifications, the reader should refer to the notice for the proposed IHA (79 FR 45592, August 5, 2014), the IHA application, EA, and associated documents referenced above this section.

Comments and Responses

A notice of preliminary determinations and proposed IHA for NSF and ASC's low-energy seismic survey was published in the Federal Register on August 5, 2015 (79 FR 45592). During the 30-day public comment period, NMFS received comments from one private citizen and the Marine Mammal Commission (Commission). The comments are posted online at: http://www.nmfs.noaa.gov/pr/permits/incidental/. Following are the substantive comments and NMFS's responses:

Comment 1: The Commission questions why L-DEO did not use 4 m (ft) as the maximum tow depth, because that depth was specified in the IHA application and should yield greater radii than a tow depth of 3 m. To estimate the buffer and exclusion zones for the seismic survey in the Scotia Sea and South Atlantic Ocean, L-DEO used two G airguns as a proxy for two GI airguns within the Nucleus modeling software and assumed a maximum tow depth of 3 m. It is also unclear why L-DEO included in Appendix A of NSF and ASC's IEE/EA the correction factors based on shallow-water measurements of 2 GI airguns in the Gulf of Mexico (GOM). The need for correction factors as large as 14.7 does substantiate the concerns continually expressed by the Commission regarding the inadequacies of the L-DEO model in

environments other than a three dimensionally uniform and boundless sea. However, the discussion of such correction factors is irrelevant because the radii L-DEO proposed to use originated directly from its model, absent any correction factors. The Commission does not understand why L-DEO mentioned correction factors that apparently were not used.

Response: In almost all previous NSF EAs using GI airgun arrays, a typical tow depth was 3 m; therefore, that was used for the modeling for the planned low-energy seismic survey. As noted in the IHA application, the model results are for G airguns, which have more energy than GI airguns of the same size; thus, those results overestimate (by approximately 10%) the distances for the 105 in^3 GI airgun array. Although the distances were known to be overestimated, no distance adjustments were made to the radii distances to account for this overestimation. In this case, the difference between a 3 m and 4 m tow depth are nominal, and would be approximately equivalent given this 10% difference. Therefore, the proposed radii distances for the buffer and exclusion zones are still valid for monitoring and mitigation as well as take estimates. NMFS, NSF, ASC, and L-DEO agree that Appendix A of the IHA application included some superfluous information about correction factors not relevant to the discussion, given this was a seismic survey in deep water and only L-DEO model results were used. NMFS believes that the L-DEO model is adequate for establishing conservative radii for monitoring and mitigation.

Comment 2: The Commission remains very concerned that the L-DEO model is not based on best available science and does not support its continued use. The Commission recommends that NMFS (1) require L-DEO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific (including sound speed profiles, bathymetry, and sediment characteristics at a minimum) and operational (including

number/type of airguns, tow depth) parameters for the proposed IHA; and (2) impose the same requirement for all future IHAs submitted by NSF, ASC, L-DEO, USGS, SIO, or any other relevant entity.

Response: At present, L-DEO cannot adjust its modeling methodology to add the environmental and site-specific parameters as requested by the Commission. NMFS is working with L-DEO, NSF, ASC, USGS, SIO, and any other relevant entity to explore ways to better consider site-specific information to inform the take estimates and development of mitigation measures for future seismic surveys with L-DEO and NSF, and NSF has been exploring different approaches in collaboration with L-DEO and other academic institutions with whom they collaborate. When available, NMFS will review and consider the final results from L-DEO's expected publications (Crone et al., in prep), in which the results of a calibration off the coast of Washington will be reported, and how they reflect on L-DEO's model.

For this seismic survey, L-DEO developed the exclusion and buffer zones based on the conservative deep-water calibration results from Diebold et al. (2010). L-DEO's current modeling approach represents the best available information to reach NMFS's determinations for the IHA. The comparisons of L-DEO's model results and the field data collected in the Gulf of Mexico illustrate a degree of conservativeness built into L-DEO's model for deep water.

NMFS acknowledges the Commission's concerns about L-DEO's current modeling approach for estimating exclusion and buffer zones and also acknowledge that L-DEO did not incorporate site-specific sound speed profiles, bathymetry, and sediment characteristics of the research area within the current approach to estimate those zones for this IHA. However, as described below, empirical data collected at two different sites and compared against model predictions indicate that other facets of the model (besides the site-specific factors cited above)

do result in a conservative estimate of exposures in the cases tested.

The NSF and ASC IHA application and IEE/EA describe the approach to establishing mitigation exclusion and buffer zones. In summary, L-DEO acquired field measurements for several array configurations at shallow- and deep-water depths during acoustic verification studies conducted in the northern Gulf of Mexico in 2003 (Tolstoy et al., 2004) and in 2007 and 2008 (Tolstoy et al., 2009). Based on the empirical data from those studies, L-DEO developed a sound propagation modeling approach that conservatively predicts received sound levels as a function of distance from a particular airgun array configuration in deep water. In 2010, L-DEO assessed the accuracy of their modeling approach by comparing the sound levels of the field measurements in the Gulf of Mexico study to its model predictions (Diebold et al., 2010). L-DEO reported that the observed sound levels from the field measurements fell almost entirely below the predicted mitigation radii curve for deep water (Diebold et al., 2010). Based on this information, L-DEO has shown that its model can reliably estimate the mitigation radii in deep water.

L-DEO's model is most directly applicable to deep water. Reflected and refracted arrivals were considered in verifying L-DEO's model. Given the planned seismic survey is entirely in deep water, and the model has been demonstrated to be conservative in deep water, NMFS concludes that the L-DEO model is an effective means to aid in determining potential impacts to marine mammals from the planned seismic survey and estimating take numbers, as well as establishing buffer and exclusion zones for mitigation.

During a March 2013 meeting, L-DEO discussed the L-DEO model with the Commission, NMFS, and NSF. L-DEO compared the Gulf of Mexico (GOM) calibration measurements (Tolstoy et al., 2004; Tolstoy et al., 2009; Diebold et al., 2010) comparison with

L-DEO model results. L-DEO showed that at the calibration sites the model overestimated the size of the exclusion zones and, therefore, is likely precautionary in most cases. Based on the best available information that the current model overestimates mitigation zones, we will not require L-DEO to re-estimate the proposed buffer and exclusion zones and associated number of marine mammal takes using operational and site-specific environmental parameters for this IHA.

However, we continue to work with the NSF, ASC, L-DEO, and other related entities on verifying the accuracy of their model. L-DEO is currently analyzing whether received levels can be measured in real-time using the ship's hydrophone streamer to estimate the sound field around the ship and determine actual distances to the buffer and exclusion zones. Crone et al. (2013) are analyzing Langseth streamer data collected in 2012 off the Washington coast shelf and slope to measure received levels in situ up to 8 km (4.3 nmi) away from the ship. While results confirm the role that bathymetry plays in propagation, it also confirmed that empirical measurements from the GOM survey used to inform buffer and exclusion zones in shallow water and model results adapted for intermediate water depths also over-estimated the size of the zones for the Washington survey. Preliminary results were presented in a poster session at the American Geophysical Union fall meeting in December 2013 (Crone et al., 2013; available at: http://berna.ldeo.columbia.edu/agu2013/agu2013.pdf) and a peer-reviewed journal publication is anticipated in 2014. When available, NMFS will review and consider the final results and how they reflect on the L-DEO model.

L-DEO has conveyed to NMFS that additional modeling efforts to refine the process and conduct comparative analysis may be possible with the availability of research funds and other resources. Obtaining research funds is typically through a competitive process, including those conducted by federal agencies. The use of models for calculating buffer and exclusion zone radii

and developing take estimates is not a requirement of the MMPA ITA process. Furthermore, NMFS does not provide specific guidance on model parameters nor prescribe a specific model for applicants as part of the MMPA ITA process. There is a level of variability not only with parameters in models, but the uncertainty associated with data used in models, and therefore the quality of the model results submitted by applicants. NMFS, however, takes all of this variability into consideration when evaluating applications. Applicants use models as a tool to evaluate potential impacts, to estimate the number of takes of marine mammals, and for mitigation purposes. NMFS takes into consideration the model used and its results in determining the potential impacts to marine mammals; however, it is just a component of NMFS's analysis during the MMPA consultation process, as NMFS also takes into consideration other factors associated with the proposed action, such as geographic location, duration of activities, context, intensity, etc. Takes generated by modeling are used as estimates, not absolutes, and are factored into NMFS's analysis accordingly. Of broader note, NMFS is currently pursuing methods that include site-specific components to allow us to better cross-check isopleth and propagation predictions submitted by applicants. Using this information, NMFS could potentially recommend modifications to take estimates and/or mitigation zones, as appropriate.

Comment 3: The Commission states that in 2011, NSF and USGS modeled sound propagation under various environmental conditions in their PEIS. L-DEO and NSF (in cooperation with Pacific Gas and Electric Company [PG&E]) also used a similar modeling approach in the recent IHA application and associated EA for a seismic survey of Diablo Canyon in California (77 FR 58256). These recent examples indicate that L-DEO, NSF, and related entities are able to implement the recommended approach, if required to do so by NMFS. The

Commission understands the constraints imposed by the current budgetary environment, but notes that other agencies that contend with similar funding constraints incorporate modeling based on site-specific parameters. USGS, L-DEO, NSF, and related entities should be held to that same standard. NMFS recently indicated that it does not, and does not believe it is appropriate to, prescribe the use of any particular modeling package (79 FR 38499). The Commission agrees that NMFS should not instruct applicants to use specific contractors or modeling packages, but it should hold applicants to the same standard, primarily one in which site- and operation-specific environmental parameters are incorporated into the models.

Response: PG&E submitted an IHA application to NMFS and the U.S. Fish and Wildlife Service for the Central Coastal California Seismic Imaging Project in 2012. The IHA application included a report of acoustic propagation modeling conducted by Greeneridge Sciences, Inc., sponsored by Padre Associates, Inc., to estimate received sound pressure level radii for airgun pulses operating off central California in the vicinity of the Diablo Canyon Nuclear Power Plant. A wave-theory model and precise waveguide parameters that describe sound reflections and refractions at the ocean surface, seafloor, and water column were used to accurately model sound transmission in the ocean. As the action proponent, PG&E funded the seismic survey and related environmental compliance documents (e.g., IHA application, Environmental Assessment, etc.). NSF, as the owner of the Langseth, served as the federal nexus for the ESA section 7 consultation and need for the preparation of the NEPA document. L-DEO is the operator of the Langseth and often applies for IHAs for NSF-funded seismic surveys conducted for scientific research purposes.

There are many different modeling products and services commercially available that applicants could potentially use in developing their take estimates and analyses for MMPA ITAs.

These different models range widely in cost, complexity, and the number of specific factors that can be considered in any particular modeling run. NMFS does not, and does not believe that it is appropriate to, prescribe the use of any particular modeling package. Rather, each applicant's approach is evaluated independently in the context of its activity. In cases where simpler models are used and there is concern that a model might not capture the variability across a parameter(s) that is not represented in the model, conservative choices are often made at certain decision points in the model to help ensure that modeled estimates are buffered in a manner that would not result in the agency underestimating the number of takes or extent of effects. In this case, results have shown that L-DEO's model reliably and conservatively estimates mitigation radii in deep water. The observed sound levels from the field measurements fell almost entirely below L-DEO's estimated mitigation radii for deep water (Diebold et al., 2010). Based on these empirical data, which illustrate the model's conservative exposure estimates across two sites, NMFS finds that L-DEO's model effectively estimates sound exposures.

NMFS encourages applicants to incorporate modeling based on site-specific and operation-specific parameters in their IHA applications, whenever possible, but it is unrealistic to require all applicants to do so in IHA applications and/or NEPA documents (EAs and EISs) as activities may vary in their scope and level of anticipated impacts, and applicants may have varying funding and resource constraints. However, it is still incumbent upon NMFS to take the uncertainty that comes along with varying models into consideration in both the analysis of effects and the consideration of mitigation measures. In this case, as described elsewhere in this section, we have considered the uncertainty associated with the applicant's model and have determined that it does not change either our findings regarding the anticipated level and severity of impacts on marine mammals or our conclusion that the mitigation measures required provide

the means of effecting the least practicable impact on the affected species or stocks and their habitat.

Of broader note, NMFS is currently pursuing methods (that include site-specific components) to allow us to better cross-check isopleth and propagation predictions submitted by applicants. Using this information, we could potentially recommend modifications to take estimates and/or mitigation zones, as appropriate.

Comment 4: The Commission recommends that NMFS either estimate the numbers of takes that could occur during the bathymetric survey, which includes the use of the multi-beam echosounder and sub-bottom profiler absent the airguns, based on the 120 dB (rms) threshold rather than the 160 dB (rms) threshold, or not include authorization for taking by the acoustic sources (echosounder, sub-bottom profiler, ADCP) in the final IHA.

Response: NMFS disagrees with the Commission's recommendation that NMFS require NSF and ASC to estimate the number of marine mammals taken when the single-beam and multi-beam echosounder, ADCP, and sub-bottom profiler are used in the absence of the airgun array based on the 120 dB (rms) threshold, for continuous sounds, rather than the 160 dB (rms) threshold, for impulsive sounds. 160 dB (rms) is the appropriate threshold for these sound sources. Continuous sounds are those whose sound pressure level remains above that of the ambient sound, with negligibly small fluctuations in level (NIOSH, 1998; ANSI, 2005), while intermittent sounds are defined as sounds with interrupted levels of low or no sound (NIOSH, 1998). Echosounder signals are emitted as separate pulses separated by silence, and thus are not continuous sounds but rather intermittent sounds. Intermittent sounds can further be defined as either impulsive or non-impulsive. Impulsive sounds have been defined as sounds which are typically transient, brief (less than 1 second), broadband, and consist of a high peak pressure with

rapid rise time and rapid decay (ANSI, 1986; NIOSH, 1998). Echosounder signals also have durations that are typically very brief (less than 1 second), with temporal characteristics that more closely resemble those of impulsive sounds than non-impulsive sounds, which typically have more gradual rise times and longer decays (ANSI, 1995; NIOSH, 1998). With regard to behavioral thresholds, we therefore consider the temporal and spectral characteristics of echosounder signals to more closely resemble those of an impulsive sound than a continuous sound.

The Commission suggests that, for certain sources considered here, the interval between pulses would not be discernible to the animal, thus rendering them effectively continuous. However, an echosounder's "rapid staccato" of pulse trains is emitted in a similar fashion as odontocete echolocation click trains. Research indicates that marine mammals, in general, have extremely fine auditory temporal resolution and can detect each signal separately (e.g., Au et al., 1988; Dolphin et al., 1995; Supin and Popov, 1995; Mooney et al., 2009), especially species with echolocation capabilities. Therefore, it is highly unlikely that marine mammals would perceive echosounder signals as being continuous.

In conclusion, echosounder, ADCP, and sub-bottom profiler signals are intermittent rather than continuous signals, and the fine temporal resolution of the marine mammals auditory systems allows them to perceive these sounds as such. Further, the physical characteristics of these signals indicate a greater similarity to the way that intermittent, impulsive sounds are received. Therefore, the 160 dB threshold (typically associated with impulsive sources) is more appropriate than the 120 dB threshold (typically associated with continuous sources) for estimating takes by behavioral harassment incidental to use of such sources.

Comment 5: The Commission believes that NMFS misinterpreted its implementing

regulations, which require that applicants include "the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities, and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity." The Commission believes that monitoring and reporting requirements need to be sufficient to provide accurate information on the numbers of marine mammals being taken and the manner in which they are taken, not merely better information on the qualitative nature of the impacts. The Commission continues to believe that appropriate g(0) and f(0) values are essential for making accurate estimates of the numbers of marine mammals taken during surveys. The Commission recommends that NMFS consult with the funding agency (e.g., NSF) and individual applicants (e.g., ASC, L-DEO, USGS, SIO, and other related entities) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken, accounting for applicable g(0) and f(0) values.

Response: NMFS does not believe that we misinterpreted the MMPA implementing regulations in our previous response that the Commission references. With respect to levels of take, NMFS interprets the sentence quoted by the Commission to require the applicants include suggested monitoring and reporting that will result in "an increased knowledge of…the level of taking…" This is the most logical interpretation, because if we were to assume that the phrase "increased knowledge of" does not modify "the level of taking," then the sentence would read: "the suggested means of accomplishing the necessary monitoring and reporting that will result in…the level of taking…," which does not make sense.

Even putting any potential grammatical questions aside, NMFS does not believe that the regulations suggests that the monitoring conducted by an authorized entity must be able to quantify the exact number of takes that occurred during the action, but rather that the monitoring increase understanding of the level and effects of the action. In fact, the Commission's comment supports this interpretation. As noted by the Commission, section 101(a)(5)(D)(iv) requires that NMFS "modify, suspend, or revoke an authorization" if it finds, among other things, that the authorized taking is having more than a negligible impact or that more than small numbers of marine mammals are being taken. Both the negligible impact and small numbers findings may be made using qualitative, or relative (compared to the stock abundance) information. The sorts of qualitative, or relative information collected during the wide variety of monitoring that is conducted pursuant to MMPA authorizations can be used to provide broad support for the findings underlying the issuance of an IHA or can highlight red flags that might necessitate either a reconsideration of an issued IHA or a change in analyses in future authorizations. NMFS's previous response is included below for reference.

NMFS's implementing regulations require that applicants include monitoring that will result in "an increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities…" This increased knowledge of the level of taking could be qualitative or relative in nature, or it could be more directly quantitative. Scientists use g(0) and f(0) values in systematic marine mammal surveys to account for the undetected animals indicated above; however, these values are not simply established and the g(0) value varies across every observer based on their sighting acumen. While we want to be clear that NMFS does not generally believe that post-activity take estimates using f(0) and g(0) are required to meet the monitoring requirement of the MMPA, in the context

of the NSF and L-DEO's monitoring plan, NMFS agrees that developing and incorporating a way to better interpret the results of their monitoring (perhaps a simplified or generalized version of g(0) and f(0)) is a good idea. NMFS is continuing to examine this issue with NSF (and other entities) to develop ways to improve their post-survey take estimates. NMFS will consult with the Commission and NMFS scientists prior to finalizing these recommendations.

NMFS notes that current monitoring measures for past and current IHAs for research seismic surveys require the collection of visual observation data by PSOs prior to, during, and after airgun operations. This data collection may contribute to baseline data on marine mammals (e.g., presence/absence) and provide some generalized support for estimated take numbers (as well as providing data regarding behavioral responses to seismic operation that are observable at the surface). However, it is unlikely that the information gathered from these cruises alone would result in any statistically robust conclusions for any particular species because of the small numbers of animals typically observed.

Comment 6: One private citizen opposed the issuance of an IHA by NMFS and the conduct of the low-energy seismic survey in the Scotia Sea and South Atlantic Ocean, September to October 2014 by NSF and ASC. The commenter stated that NMFS should protect marine life from harm.

Response: As described in detail in the notice of the proposed IHA (79 FR 45592, August 5, 2014), as well as in this document, NMFS does not believe NSF and ASC's low-energy seismic survey would cause injury, serious injury, or mortality to marine mammals, and no take by injury, serious injury, or mortality is authorized. The required monitoring and mitigation measures that NSF and ASC will implement during the low-energy seismic survey will further reduce the potential impacts on marine mammals to the lowest level practicable.

NMFS anticipates only behavioral disturbance to occur during the conduct of the low-energy seismic survey.

Description of the Marine Mammals in the Specified Geographic Area of the Specified Activity

Various national Antarctic research programs (e.g., British Antarctic Survey, Australian Antarctic Division, and NMFS National Marine Mammal Laboratory), academic institutions (e.g., Duke University, University of St. Andrews, and Woods Hole Oceanographic Institution), and other organizations (e.g., South Georgia Museum, Fundacion Cethus, Whale and Dolphin Conservation, and New England Aquarium) have conducted scientific cruises and/or examined data on marine mammal sightings along the coast of Antarctica, south Atlantic Ocean, Scotia Sea, and around South Georgia and South Sandwich islands, and these data were considered in evaluating potential marine mammals in the action area. Records from the International Whaling Commission's International Decade of Cetacean Research (IDCR), Southern Ocean Collaboration Program (SOC), and Southern Ocean Whale and Ecosystem Research (IWC-SOWER) circumpolar cruises were also considered.

The marine mammals that generally occur in the planned action area belong to three taxonomic groups: mysticetes (baleen whales), odontocetes (toothed whales), and pinnipeds (seals and sea lions). The marine mammal species that could potentially occur within the southern Atlantic Ocean in proximity to the action area in the Scotia Sea include 32 species of cetaceans and 7 species of pinnipeds.

The waters of the Scotia Sea and southern Atlantic Ocean, especially those near South Georgia Island, are characterized by high biomass and productivity of phytoplankton, zooplankton, and vertebrate predators, and may be a feeding ground for many of these marine mammals (Richardson, 2012). In general, many of the species present in the sub-Antarctic study

area may be present or migrating through the Scotia Sea during the planned low-energy seismic survey. Many of the species that may be potentially present in the study area seasonally migrate to higher latitudes near Antarctica. In general, most large whale species (except for the killer whale) migrate north in the middle of the austral winter and return to Antarctica in the early austral summer.

The six species of pinnipeds that are found in the southern Atlantic Ocean and Southern Ocean and may be present in the planned study area include the crabeater (Lebodon carcinophagus), leopard (Hydrurga leptonyx), Weddell (Leptonychotes weddellii), southern elephant (Mirounga leonina), Antarctic fur (Arctocephalus gazella), and Subantarctic fur (Arctocephalus tropicalis) seal. Many of these pinniped species breed on either the pack ice or subantarctic islands. The southern elephant seal and Antarctic fur seal have haul-outs and rookeries that are located on subantarctic islands and prefer beaches. The Ross seal (Ommatophoca rossii) is generally found in dense consolidated pack ice and on ice floes, but may migrate into open water to forage. This species' preferred habitat is not in the planned study area, and thus it is not considered further in this document.

Marine mammal species likely to be encountered in the planned study area that are listed as endangered under the U.S. Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.), includes the southern right (Eubalaena australis), humpback (Megaptera novaeangliae), sei (Balaenoptera borealis), fin (Balaenoptera physalus), blue (Balaenoptera musculus), and sperm (Physeter macrocephalus) whale.

In addition to the 26 species known to occur in the Scotia Sea and the southern Atlantic Ocean, there are 14 cetacean species with ranges that are known to potentially occur in the waters of the study area: pygmy right (Caperea marginata), Bryde's (Balaenoptera brydei),

dwarf minke (Balaenoptera acutorostrata spp.), pygmy blue (Balaenoptera musculus brevicauda), pygmy sperm (Kogia breviceps), dwarf sperm (Kogia sima), Andrew's beaked (Mesoplodon bowdoini), Blainville's beaked (Mesoplodon densirostris), Hector's beaked (Mesoplodon hectori), and spade-toothed beaked (Mesoplodon traversii) whale, and Commerson's (Cephalorhynchus commersonii), Dusky (Lagenorhynchus obscurus), bottlenose (Tursiops truncatus), and Risso's (Grampus griseus) dolphin. However, these species have not been sighted and are not expected to occur where the planned activities will take place. These species are not considered further in this document. Table 2 (below) presents information on the habitat, occurrence, distribution, abundance, population status, and conservation status of the species of marine mammals that may occur in the planned study area during September to October 2014.

Table 2. The habitat, occurrence, range, regional abundance, and conservation status of marine mammals that may occur in or near the low-energy seismic survey area in the Scotia Sea and southern Atlantic Ocean (See text and Tables 6 and 7 in NSF and ASC's IHA application for further details).

Species	Habitat	Occurrence	Range	Population Estimate	ESA[1]	MMPA[2]
Mysticetes						
Southern right whale (Eubalaena australis)	Coastal, pelagic	Common	Circumpolar 20 to 55º South	8,000[3] to 15,000[4]	EN	D
Pygmy right whale (Caperea marginata)	Coastal, pelagic	Rare	30 to 55º South	NA	NL	NC
Humpback whale (Megaptera novaeangliae)	Pelagic, nearshore waters, and banks	Common	Cosmopolitan	35,000 to 40,000[3] - Worldwide 9,484[5] – Scotia Sea and Antarctica Peninsula	EN	D
Minke whale (Balaenoptera acutorostrata including dwarf sub-species)	Pelagic and coastal	Common	Circumpolar – Southern Hemisphere to 65º South	NA	NL	NC
Antarctic minke whale (Balaenoptera bonaerensis)	Pelagic, ice floes	Common	7º South to ice edge (usually 20 to 65º South)	Several 100,000[3] - Worldwide 18,125[5] - Scotia Sea and Antarctica Peninsula	NL	NC
Bryde's whale (Balaenoptera brydei)	Pelagic and coastal	Rare	Circumglobal 40º North to 40º South	NA	NL	NC
Sei whale (Balaenoptera borealis)	Primarily offshore, pelagic	Uncommon	Migratory, Feeding Concentration 40 to 50º South	80,000[3] - Worldwide	EN	D
Fin whale (Balaenoptera physalus)	Continental slope, pelagic	Common	Cosmopolitan, Migratory	140,000[3] - Worldwide 4,672[5] - Scotia Sea and Antarctica Peninsula	EN	D
Blue whale (Balaenoptera musculus; including pygmy blue whale [Balaenoptera musculus brevicauda])	Pelagic, shelf, coastal	Uncommon	Migratory Pygmy blue whale – North of Antarctic Convergence 55º South	8,000 to 9,000[3] - Worldwide 1,700[6] - Southern Ocean	EN	D
Odontocetes						

Sperm whale (Physeter macrocephalus)	Pelagic, deep sea	Common	Cosmopolitan, Migratory	360,000[3] – Worldwide 9,500[3] - Antarctic	EN	D
Pygmy sperm whale (Kogia breviceps)	Pelagic, slope	Rare	Widely distributed in tropical and temperate zones	NA	NL	NC
Dwarf sperm whale (Kogia sima)	Pelagic, slope	Rare	Widely distributed in tropical and temperate zones	NA	NL	NC
Arnoux's beaked whale (Berardius arnuxii)	Pelagic	Common	Circumpolar in Southern Hemisphere, 24 to 78º South	NA	NL	NC
Cuvier's beaked whale (Ziphius cavirostris)	Pelagic	Uncommon	Cosmopolitan	NA	NL	NC
Shepherd's beaked whale (Tasmacetus shepherdi)	Pelagic	Common	Circumpolar – south of 30º South	NA	NL	NC
Southern bottlenose whale (Hyperoodon planifrons)	Pelagic	Common	Circumpolar - 30º South to ice edge	500,000[3] – South of Antarctic Convergence	NL	NC
Andrew's beaked whale (Mesoplodon bowdoini)	Pelagic	Rare	32 to 55º South	NA	NL	NC
Blainville's beaked whale (Mesoplodon densirostris)	Pelagic	Rare	Temperate and tropical waters worldwide	NA	NL	NC
Gray's beaked whale (Mesoplodon grayi)	Pelagic	Common	30º South to Antarctic waters	NA	NL	NC
Hector's beaked whale (Mesoplodon hectori)	Pelagic	Rare	Circumpolar - cool temperate waters of Southern Hemisphere	NA	NL	NC
Spade-toothed beaked whale (Mesoplodon traversii)	Pelagic	Rare	Circumantarctic	NA	NL	NC
Strap-toothed beaked whale (Mesoplodon layardii)	Pelagic	Common	30º South to Antarctic Convergence	NA	NL	NC
Killer whale (Orcinus orca)	Pelagic, shelf,	Common	Cosmopolitan	80,000[3] – South of Antarctic	NL	NC

	coastal, pack ice			Convergence 25,000[7] - Southern Ocean		
Long-finned pilot whale (Globicephala melas)	Pelagic, shelf, coastal	Common	Circumpolar - 19 to 68º South in Southern Hemisphere	200,000[3,8] – South of Antarctic Convergence	NL	NC
Risso's dolphin (Grampus griseus)	Shelf, slope, seamounts	Rare	60º North to 60º South	NA	NL	NC
Bottlenose dolphin (Tursiops truncatus)	Offshore, inshore, coastal, estuaries	Rare	45º North to 45º South	>625,500[3] - Worldwide	NL	NC
Southern right whale dolphin (Lissodelphis peronii)	Pelagic	Uncommon	12 to 65º South	NA	NL	NC
Peale's dolphin (Lagenorhynchus australis)	Coastal, continental shelf, islands	Uncommon	33 to 60º South	NA 200 – southern Chile[3]	NL	NC
Commerson's dolphin (Cephalorhynchus commersonii)	Coastal, continental shelf, islands	Rare	South America Falkland Islands Kerguelen Islands	3,200 – Strait of Magellan[3]	NL	NC
Dusky dolphin (Lagenorhynchus obscurus)	Coastal, continental shelf and slope	Rare	Widespread in Southern Hemisphere	NA	NL	NC
Hourglass dolphin (Lagenorhynchus cruciger)	Pelagic, ice edge	Common	33º South to pack ice	144,000[3] – South of Antarctic Convergence	NL	NC
Spectacled porpoise (Phocoena dioptrica)	Coastal, pelagic	Uncommon	Circumpolar – Southern Hemisphere	NA	NL	NC
Pinnipeds						
Crabeater seal (Lobodon carcinophaga)	Coastal, pack ice	Common	Circumpolar - Antarctic	5,000,000 to 15,000,000[3,9]	NL	NC
Leopard seal (Hydrurga leptonyx)	Pack ice, sub-Antarctic islands	Common	Sub-Antarctic islands to pack ice	220,000 to 440,000[3,10]	NL	NC
Ross seal (Ommatophoca rossii)	Pack ice, smooth ice floes, pelagic	Rare	Circumpolar - Antarctic	130,000[3] 20,000 to 220,000[14]	NL	NC
Weddell seal (Leptonychotes weddellii)	Fast ice, pack ice, sub-Antarctic	Uncommon	Circumpolar – Southern Hemisphere	500,000 to 1,000,000[3,11]	NL	NC

	islands					
Southern elephant seal (Mirounga leonina)	Coastal, pelagic, sub-Antarctic waters	Common	Circumpolar - Antarctic Convergence to pack ice	640,000[12] to 650,000[3], 470,000 – South Georgia Island[14]	NL	NC
Antarctic fur seal (Arctocephalus gazella)	Shelf, rocky habitats	Common	Sub-Antarctic islands to pack ice edge	1,600,000[13] to 3,000,000[3]	NL	NC
Subantarctic fur seal (Arctocephalus tropicalis)	Shelf, rocky habitats	Uncommon	Subtropical front to sub-Antarctic islands and Antarctica	Greater than 310,000[3]	NL	NC

NA = Not available or not assessed.
[1] U.S. Endangered Species Act: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.
[2] U.S. Marine Mammal Protection Act: D = Depleted, S = Strategic, NC = Not Classified.
[3] Jefferson et al., 2008.
[4] Kenney, 2009.
[5] Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) survey area (Reilly et al., 2004)
[6] Sears and Perrin, 2009.
[7] Ford, 2009.
[8] Olson, 2009.
[9] Bengston, 2009.
[10] Rogers, 2009.
[11] Thomas and Terhune, 2009.
[12] Hindell and Perrin, 2009.
[13] Arnould, 2009.
[14] Academic Press, 2009.

Refer to sections 3 and 4 of NSF and ASC's IHA application for detailed information regarding the abundance and distribution, population status, and life history and behavior of these other marine mammal species and their occurrence in the planned project area. The IHA application also presents how NSF and ASC calculated the estimated densities for the marine mammals in the study area. NMFS has reviewed these data and determined them to be the best available scientific information for the purposes of the IHA.

Potential Effects of the Specified Activity on Marine Mammals

This section includes a summary and discussion of the ways that the types of stressors associated with the specified activity (e.g., seismic airgun operation, vessel movement, gear deployment) have been observed to impact marine mammals. This discussion may also include reactions that we consider to rise to the level of a take and those that we do not consider to rise to the level of take (for example, with acoustics, we may include a discussion of studies that showed animals not reacting at all to sound or exhibiting barely measureable avoidance). This section is intended as a background of potential effects and does not consider either the specific manner in which this activity will be carried out or the mitigation that will be implemented, and how either of those would shape the anticipated impacts from this specific activity. The "Estimated Take by Incidental Harassment" section later in this document will include a quantitative analysis of the number of individuals that are expected to be taken by this activity. The "Negligible Impact Analysis" section will include the analysis of how this specific activity will impact marine mammals and will consider the content of this section, the "Estimated Take by Incidental Harassment" section, the "Mitigation" section, and the "Anticipated Effects on Marine Mammal Habitat" section to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals and from that on the affected

marine mammal populations or stocks.

When considering the influence of various kinds of sound on the marine environment, it is necessary to understand that different kinds of marine life are sensitive to different frequencies of sound. Based on available behavioral data, audiograms have been derived using auditory evoked potentials, anatomical modeling, and other data, Southall et al. (2007) designate "functional hearing groups" for marine mammals and estimate the lower and upper frequencies of functional hearing of the groups. The functional groups and the associated frequencies are indicated below (though animals are less sensitive to sounds at the outer edge of their functional range and most sensitive to sounds of frequencies within a smaller range somewhere in the middle of their functional hearing range):

- Low-frequency cetaceans (13 species of mysticetes): functional hearing is estimated to occur between approximately 7 Hz and 30 kHz;
- Mid-frequency cetaceans (32 species of dolphins, six species of larger toothed whales, and 19 species of beaked and bottlenose whales): functional hearing is estimated to occur between approximately 150 Hz and 160 kHz;
- High-frequency cetaceans (eight species of true porpoises, six species of river dolphins, Kogia spp., the franciscana [Pontoporia blainvillei], and four species of cephalorhynchids): functional hearing is estimated to occur between approximately 200 Hz and 180 kHz; and
- Phocid pinnipeds in water: functional hearing is estimated to occur between approximately 75 Hz and 100 kHz;
- Otariid pinnipeds in water: functional hearing is estimated to occur between approximately 100 Hz and 40 kHz.

As mentioned previously in this document, 26 marine mammal species (20 cetacean and 6 pinniped species) are likely to occur in the seismic survey area. Of the 20 cetacean species likely to occur in NSF and ASC's action area, 7 are classified as low-frequency cetaceans (southern right, humpback, minke, Antarctic minke, sei, fin, and blue whale), 12 are classified as mid-frequency cetaceans (sperm, Arnoux's beaked, Cuvier's beaked, Shepherd's beaked, southern bottlenose, Gray's beaked, strap-toothed beaked, killer, and long-finned pilot whale, and southern right whale, Peale's, and hourglass dolphin), and 1 is classified as a high-frequency cetacean (spectacled porpoise) (Southall et al., 2007). Of the 6 pinniped species likely to occur in NSF and ASC's planned action area, 4 are classified as phocid pinnipeds (crabeater, leopard, Weddell, and southern elephant seal), and 2 are classified as otariid pinnipeds (Antarctic and Subantarctic fur seal) (Southall et al., 2007). A species functional hearing group is a consideration when we analyze the effects of exposure to sound on marine mammals.

Acoustic stimuli generated by the operation of the airguns, which introduce sound into the marine environment, may have the potential to cause Level B harassment of marine mammals in the survey area. The effects of sounds from airgun operations might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, temporary or permanent hearing impairment, or non-auditory physical or physiological effects (Richardson et al., 1995; Gordon et al., 2004; Nowacek et al., 2007; Southall et al., 2007). Permanent hearing impairment, in the unlikely event that it occurred, would constitute injury, but temporary threshold shift (TTS) is not an injury (Southall et al., 2007). Although the possibility cannot be entirely excluded, it is unlikely that the planned project will result in any cases of temporary or permanent hearing impairment, or any significant non-auditory physical or physiological effects. Based on the available data and studies described here, some behavioral disturbance is expected,

but NMFS expects the disturbance to be localized and short-term. NMFS described the range of potential effects from the specified activity in the notice of the proposed IHA (79 FR 45592). A more comprehensive review of these issues can be found in the "Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement prepared for Marine Seismic Research that is funded by the National Science Foundation and conducted by the U.S. Geological Survey" (NSF/USGS, 2011) and L-DEO's "Draft Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Atlantic Ocean off Cape Hatteras, September to October 2014."

The notice of the proposed IHA (79 FR 45592, August 5, 2014) included a discussion of the effects of sounds from airguns on mysticetes and odontocetes, including tolerance, masking, behavioral disturbance, hearing impairment, and other non-auditory physical effects. NMFS refers the readers to USGS's IHA application and EA for additional information on the behavioral reactions (or lack thereof) by all types of marine mammals to seismic vessels.

Anticipated Effects on Marine Mammal Habitat

NMFS included a detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine fish and invertebrates, in the notice of the proposed IHA (79 FR 45592, August 5, 2014). The seismic survey will not result in any permanent impacts on habitats used by the marine mammals in the study area, including the food sources they use (i.e., fish and invertebrates), and there will be no physical damage to any habitat. While NMFS anticipates that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification, this impact to habitat is temporary and reversible, which was considered in further detail in the notice of the proposed IHA (79 FR 45592, August 5, 2014), as behavioral modification. The main impact associated

with the activity will be temporarily elevated noise levels and the associated direct effects on marine mammals.

Mitigation

In order to issue an Incidental Take Authorization (ITA) under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and the availability of such species or stock for taking for certain subsistence uses (where relevant).

NSF and ASC reviewed the following source documents and have incorporated a suite of appropriate mitigation measures into their project description.

(1) Protocols used during previous NSF and USGS-funded seismic research cruises as approved by NMFS and detailed in the "Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey;"

(2) Previous IHA applications and IHAs approved and authorized by NMFS; and

(3) Recommended best practices in Richardson et al. (1995), Pierson et al. (1998), and Weir and Dolman, (2007).

To reduce the potential for disturbance from acoustic stimuli associated with the planned activities, NSF, ASC, and their designees shall implement the following mitigation measures for marine mammals:

(1) Exclusion zones around the sound source;

(2) Speed and course alterations;

(3) Shut-down procedures; and

(4) Ramp-up procedures.

Exclusion Zones – During pre-planning of the cruise, the smallest airgun array was identified that could be used and still meet the geophysical scientific objectives. NSF and ASC use radii to designate exclusion and buffer zones and to estimate take for marine mammals. Table 3 (see below) shows the distances at which one would expect to receive three sound levels (160, 180, and 190 dB) from the two GI airgun array. The 180 and 190 dB level shut-down criteria are applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000). NSF and ASC used these levels to establish the exclusion and buffer zones.

Table 3. Predicted and modeled (two 105 in^3 GI airgun array) distances to which sound levels ≥ 160, 180, and 190 dB re 1 μPa (rms) could be received in deep water during the low-energy seismic survey in the Scotia Sea and the southern Atlantic Ocean, September to October 2014.

Source and Total Volume	Tow Depth (m)	Water Depth (m)	Predicted RMS Radii Distances (m) for 2 GI Airgun Array		
			160 dB	180 dB	190 dB
Two GI Airguns (105 in^3)	3 to 4	Deep (>1,000)	670 (2,198.2 ft)	100 (328.1 ft)	20 (65.6 ft) *100 will be used for pinnipeds as well as cetaceans*

Received sound levels have been modeled by L-DEO for a number of airgun configurations, including two 45 in^3 Nucleus G airguns, in relation to distance and direction from the airguns (see Figure 2 of the IHA application). In addition, propagation measurements of pulses from two GI airguns have been reported for shallow water (approximately 30 m [98.4 ft] depth) in the GOM (Tolstoy et al., 2004). However, measurements were not made for the two GI airguns in deep water. The model does not allow for bottom interactions, and is most directly applicable to deep water. Based on the modeling, estimates of the maximum distances from the

GI airguns where sound levels are predicted to be 190, 180, and 160 dB re 1 µPa (rms) in shallow, intermediate, and deep water were determined (see Table 3 above).

Empirical data concerning the 190, 180, and 160 dB (rms) distances were acquired for various airgun arrays based on measurements during the acoustic verification studies conducted by L-DEO in the northern GOM in 2003 (Tolstoy et al., 2004) and 2007 to 2008 (Tolstoy et al., 2009). Results of the 18 and 36 airgun arrays are not relevant for the two GI airguns to be used in the planned survey because the airgun arrays are not the same size or volume. The empirical data for the 6, 10, 12, and 20 airgun arrays indicate that, for deep water, the L-DEO model tends to overestimate the received sound levels at a given distance (Tolstoy et al., 2004). Measurements were not made for the two GI airgun array in deep water; however, NSF and ASC plan to use the safety radii predicted by L-DEO's model for the planned GI airgun operations in deep water, although they are likely conservative given the empirical results for the other arrays.

Based on the modeling data, the outputs from the pair of 105 in^3 GI airguns planned to be used during the seismic survey are considered a low-energy acoustic source in the NSF/USGS PEIS (2011) for marine seismic research. A low-energy seismic source was defined in the NSF/USGS PEIS as an acoustic source whose received level at 100 m is less than 180 dB. The NSF/USGS PEIS also established for these low-energy sources, a standard exclusion zone of 100 m for all low-energy sources in water depths greater than 100 m. This standard 100 m exclusion zone will be used during the planned low-energy seismic survey. The 180 and 190 dB (rms) radii are shut-down criteria applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000); these levels were used to establish exclusion zones. Therefore, the assumed 180 and 190 dB radii are 100 m for intermediate and deep water. If the PSO detects a marine

mammal within or about to enter the appropriate exclusion zone, the airguns will be shut-down immediately.

Speed and Course Alterations – If a marine mammal is detected outside the exclusion zone and, based on its position and direction of travel (relative motion), is likely to enter the exclusion zone, changes of the vessel's speed and/or direct course will be considered if this does not compromise operational safety or damage the deployed equipment. This will be done if operationally practicable while minimizing the effect on the planned science objectives. For marine seismic surveys towing large streamer arrays, course alterations are not typically implemented due to the vessel's limited maneuverability. However, the Palmer will be towing a relatively short hydrophone streamer, so its maneuverability during airgun operations with the hydrophone streamer will not be limited as vessels towing long streamers, thus increasing the potential to implement course alterations, if necessary. After any such speed and/or course alteration is begun, the marine mammal activities and movements relative to the seismic vessel will be closely monitored to ensure that the marine mammal does not approach within the exclusion zone. If the marine mammal appears likely to enter the exclusion zone, further mitigation actions will be taken, including further speed and/or course alterations, and/or shut-down of the airgun(s). Typically, during airgun operations, the source vessel is unable to change speed or course, and one or more alternative mitigation measures will need to be implemented.

Shut-down Procedures - If a marine mammal is detected outside the exclusion zone for the airgun(s) and the vessel's speed and/or course cannot be changed to avoid having the animal enter the exclusion zone, NSF and ASC will shut-down the operating airgun(s) before the animal is within the exclusion zone. Likewise, if a marine mammal is already within the exclusion zone when first detected, the seismic source will be shut-down immediately.

Following a shut-down, NSF and ASC will not resume airgun activity until the marine mammal has cleared the exclusion zone. NSF and ASC will consider the animal to have cleared the exclusion zone if:

- A PSO has visually observed the animal leave the exclusion zone, or
- A PSO has not sighted the animal within the exclusion zone for 15 minutes for species with shorter dive durations (i.e., small odontocetes and pinnipeds), or 30 minutes for species with longer dive durations (i.e., mysticetes and large odontocetes, including sperm, pygmy and dwarf sperm, killer, and beaked whales).

Although power-down procedures are often standard operating practice for seismic surveys, they will not be used during this planned seismic survey because powering-down from two airguns to one airgun would make only a small difference in the exclusion zone(s) that probably would not be enough to allow continued one-airgun operations if a marine mammal came within the exclusion zone for two airguns.

Ramp-up Procedures – Ramp-up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of airguns firing until the full volume of the airgun array is achieved. The purpose of a ramp-up is to "warn" marine mammals in the vicinity of the airguns and to provide the time for them to leave the area, avoiding any potential injury or impairment of their hearing abilities. NSF and ASC will follow a ramp-up procedure when the airgun array begins operating after a specified period without airgun operations or when a shut-down has exceeded that period. NSF and ASC proposed that, for the present cruise, this period would be approximately 15 minutes. SIO, L-DEO, and USGS have used similar periods (approximately 15 minutes) during previous low-energy seismic surveys.

Ramp-up will begin with a single GI airgun (105 in^3). The second GI airgun (105 in^3) will be added after 5 minutes. During ramp-up, the PSOs will monitor the exclusion zone, and if marine mammals are sighted, a shut-down will be implemented as though both GI airguns were operational.

If the complete exclusion zone has not been visible for at least 30 minutes prior to the start of operations in either daylight or nighttime, NSF and ASC will not commence the ramp-up. Given these provisions, it is likely that the airgun array will not be ramped-up from a complete shut-down at night or in thick fog, because the outer part of the exclusion zone for that array would not be visible during those conditions. If one airgun has operated, ramp-up to full power will be permissible at night or in poor visibility, on the assumption that marine mammals will be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away if they choose. A ramp-up from a shut-down may occur at night, but only where the exclusion zone is small enough to be visible. NSF and ASC will not initiate a ramp-up of the airguns if a marine mammal is sighted within or near the applicable exclusion zones during the day or close to the vessel at night.

Mitigation Conclusions

NMFS has carefully evaluated the applicant's mitigation measures and has considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. NMFS's evaluation of potential measures included consideration of the following factors in relation to one another:

(1) The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;

(2) The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and

(3) The practicability of the measure for applicant implementation including consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the activity.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

(1) Avoidance of minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

(2) A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of airguns, or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

(3) A reduction in the number of time (total number or number at biologically important time or location) individuals would be exposed to received levels of airguns, or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

(4) A reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels of airguns, or other activities, or other activities expected to result in the take of marine mammals (this goal may contribute to a, above, or to reducing the severity of harassment takes only).

(5) Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.

(6) For monitoring directly related to mitigation – an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on NMFS's evaluation of the applicant's measures, as well as other measures considered by NMFS or recommended by the public, NMFS has determined that the mitigation measures provide the means of effecting the least practicable impact on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

In order to issue an ITA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for IHAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the action area. NSF and ASC submitted a marine mammal monitoring plan as part of the IHA application. It can be found in Section 13 of the IHA application. The plan has not been modified or supplemented between the notice of the proposed IHA (79 FR 45592, August 5, 2014) and this final notice announcing the issuance of the IHA, as none of the comments or new information received from the public during the public comment period required a change to the plan.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

(1) An increase in the probability of detecting marine mammals, both within the mitigation zone (thus allowing for more effective implementation of the mitigation) and in general to generate more data to contribute to the analyses mentioned below;

(2) An increase in our understanding of how many marine mammals are likely to be exposed to levels of sound (airguns) that we associate with specific adverse effects, such as behavioral harassment, TTS, or PTS;

(3) An increase in our understanding of how marine mammals respond to stimuli expected to result in take and how anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

- Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict received level, distance from source, and other pertinent information);
- Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict received level, distance from source, and other pertinent information); and
- Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli

(4) An increased knowledge of the affected species; and

(5) An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

Monitoring

NSF and ASC will conduct marine mammal monitoring during the low-energy seismic survey, in order to implement the mitigation measures that require real-time monitoring and to satisfy the anticipated monitoring requirements of the IHA. NSF and ASC's "Monitoring Plan" is described below this section. NSF and ASC understand that this monitoring plan will be subject to continuing review by NMFS and that refinements may be required. The monitoring work described here has been planned as a self-contained project independent of any other related monitoring projects that may be occurring simultaneously in the same regions. NSF and ASC are prepared to discuss coordination of their monitoring program with any related work that might be done by other groups insofar as this is practical and desirable.

Vessel-based Visual Monitoring

NSF and ASC's PSOs will be based aboard the seismic source vessel and will watch for marine mammals near the vessel during daytime airgun operations and during any ramp-ups of the airguns at night. PSOs will also watch for marine mammals near the seismic vessel for at least 30 minutes prior to the start of airgun operations and after an extended shut-down (i.e., greater than approximately 15 minutes for this low-energy seismic survey). When feasible, PSOs will conduct observations during daytime periods when the seismic system is not operating (such as during transits) for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on PSO observations, the airguns will be shut-down when marine mammals are observed within or about to enter a designated exclusion zone. The exclusion zone is a region in which a possibility exists of adverse effects on animal hearing or other physical effects.

During seismic operations in the Scotia Sea and southern Atlantic Ocean, at least three PSOs will be based aboard the Palmer. At least one PSO will stand watch at all times while the Palmer is operating airguns during the low-energy seismic survey; this procedure will also be followed when the vessel is in transit. NSF and ASC will appoint the PSOs with NMFS's concurrence. The lead PSO will be experienced with marine mammal species in the Scotia Sea, southern Atlantic Ocean, and/or Southern Ocean, the second and third PSOs will receive additional specialized training from the lead PSO to ensure that they can identify marine mammal species commonly found in the Scotia Sea and southern Atlantic Ocean. Observations will take place during ongoing daytime operations and nighttime ramp-ups of the airguns. During the majority of seismic operations, at least one PSO will be on duty from observation platforms (i.e., the best available vantage point on the source vessel) to monitor marine mammals near the seismic vessel. PSO(s) will be on duty in shifts no longer than 4 hours in duration. Other crew will also be instructed to assist in detecting marine mammals and implementing mitigation requirements (if practical). Before the start of the low-energy seismic survey, the crew will be given additional instruction on how to do so.

The Palmer is a suitable platform for marine mammal observations and will serve as the platform from which PSOs will watch for marine mammals before and during seismic operations. Two locations are likely as observation stations onboard the Palmer. One observing station is located on the bridge level, with the PSO eye level at approximately 16.5 m (54.1 ft) above the waterline and the PSO will have a good view around the entire vessel. In addition, there is an aloft observation tower for the PSO approximately 24.4 m (80.1 ft) above the waterline that is protected from the weather, and affords PSOs an even greater view. The

approximate view around the vessel from the bridge is 270º and from the aloft observation tower is 360º.

Standard equipment for PSOs will be reticle binoculars. Night-vision equipment will not be available. The PSOs will be in communication with ship's officers on the bridge and scientists in the vessel's operations laboratory, so they can advise promptly of the need for avoidance maneuvers or seismic source shut-down. During daytime, the PSO(s) will scan the area around the vessel systematically with reticle binoculars (e.g., 7 x 50 Fujinon FMTRC-SX) and the naked eye. These binoculars will have a built-in daylight compass. Estimating distances is done primarily with the reticles in the binoculars. The PSO(s) will be in direct (radio) wireless communication with ship's officers on the bridge and scientists in the vessel's operations laboratory during seismic operations, so they can advise the vessel operator, science support personnel, and the science party promptly of the need for avoidance maneuvers or a shut-down of the seismic source.

When a marine mammal is detected within or about to enter the designated exclusion zone, the airguns will immediately be shut-down, unless the vessel's speed and/or course can be changed to avoid having the animal enter the exclusion zone. The PSO(s) will continue to maintain watch to determine when the animal is outside the exclusion zone by visual confirmation. Airgun operations will not resume until the animal is confirmed to have left the exclusion zone, or is not observed after 15 minutes for species with shorter dive durations (small odontocetes and pinnipeds) or 30 minutes for species with longer dive durations (mysticetes and large odontocetes, including sperm, killer, and beaked whales).

PSO Data and Documentation

PSOs will record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. Data will be used to estimate numbers of animals potentially "taken" by harassment (as defined in the MMPA). They will also provide information needed to order a shut-down of the airguns when a marine mammal is within or near the exclusion zone. Observations will also be made during daytime periods when the Palmer is underway without seismic operations (i.e., transits to, from, and through the study area) to collect baseline biological data.

When a sighting is made, the following information about the sighting will be recorded:

1. Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the seismic source or vessel (e.g., none, avoidance, approach, paralleling, etc.), and behavioral pace.

2. Time, location, heading, speed, activity of the vessel, sea state, wind force, visibility, and sun glare.

The data listed under (2) will also be recorded at the start and end of each observation watch, and during a watch whenever there is a change in one or more of the variables.

All observations, as well as information regarding ramp-ups or shut-downs will be recorded in a standardized format. Data will be entered into an electronic database. The data accuracy will be verified by computerized data validity checks as the data are entered and by subsequent manual checking of the database by the PSOs at sea. These procedures will allow initial summaries of data to be prepared during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, and other programs for further processing and archiving.

Results from the vessel-based observations will provide the following information:

1. The basis for real-time mitigation (airgun shut-down).

2. Information needed to estimate the number of marine mammals potentially taken by harassment, which must be reported to NMFS.

3. Data on the occurrence, distribution, and activities of marine mammals in the area where the seismic study is conducted.

4. Information to compare the distance and distribution of marine mammals relative to the source vessel at times with and without seismic activity.

5. Data on the behavior and movement patterns of marine mammals seen at times with and without seismic activity.

Reporting

NSF and ASC will submit a comprehensive report to NMFS within 90 days after the end of the cruise. The report will describe the operations that were conducted and sightings of marine mammals near the operations. The report submitted to NMFS will provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations and all marine mammal sightings (i.e., dates, times, locations, activities, and associated seismic survey activities). The report will include, at a minimum:

- Summaries of monitoring effort – total hours, total distances, and distribution of marine mammals through the study period accounting for Beaufort sea state and other factors affecting visibility and detectability of marine mammals;

- Analyses of the effects of various factors influencing detectability of marine mammals including Beaufort sea state, number of PSOs, and fog/glare;

- Species composition, occurrence, and distribution of marine mammals sightings including date, water depth, numbers, age/size/gender, and group sizes, and analyses of the effects of seismic operations;
- Sighting rates of marine mammals during periods with and without airgun activities (and other variables that could affect detectability);
- Initial sighting distances versus airgun activity state;
- Closest point of approach versus airgun activity state;
- Observed behaviors and types of movements versus airgun activity state;
- Numbers of sightings/individuals seen versus airgun activity state; and
- Distribution around the source vessel versus airgun activity state.

The report will also include estimates of the number and nature of exposures that could result in "takes" of marine mammals by harassment or in other ways. NMFS will review the draft report and provide any comments it may have, and NSF and ASC will incorporate NMFS's comments and prepare a final report. After the report is considered final, it will be publicly available on the NMFS website at: http://www.nmfs.noaa.gov/pr/permits/incidental/.

Reporting Prohibited Take - In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as an injury (Level A harassment), serious injury or mortality (e.g., ship-strike, gear interaction, and/or entanglement), NSF and ASC would immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS at 301-427-8401 and/or by email to Jolie.Harrison@noaa.gov and Howard.Goldstein@noaa.gov. The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with NSF and ASC to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. NSF and ASC may not resume their activities until notified by NMFS via letter or e-mail, or telephone.

Reporting an Injured or Dead Marine Mammal with an Unknown Cause of Death - In the event that NSF and ASC discover an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition), NSF and ASC shall immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401, and/or by email to Jolie.Harrison@noaa.gov and

Howard.Goldstein@noaa.gov. The report must include the same information identified in the paragraph above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with NSF and ASC to determine whether modifications in the activities are appropriate.

Reporting an Injured or Dead Marine Mammal Not Related to the Activities - In the event that NSF and ASC discover an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate or advanced decomposition, or scavenger damage), NSF and ASC will report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401, and/or by email to Jolie.Harrison@noaa.gov and Howard.Goldstein@noaa.gov, within 24 hours of discovery. NSF and ASC will provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS. Activities may continue while NMFS reviews the circumstances of the incident.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Table 4. NMFS's current underwater acoustic exposure criteria:

Impulsive (Non-Explosive) Sound		
Criterion	Criterion Definition	Threshold
Level A harassment (injury)	Permanent threshold shift (PTS)	180 dB re 1 µPa-m (root means

	(Any level above that which is known to cause TTS)	square [rms]) (cetaceans) 190 dB re 1 µPa-m (rms) (pinnipeds)
Level B harassment	Behavioral disruption (for impulsive noise)	160 dB re 1 µPa-m (rms)
Level B harassment	Behavioral disruption (for continuous noise)	120 dB re 1 µPa-m (rms)

Level B harassment is anticipated and authorized as a result of the low-energy seismic survey in the Scotia Sea and southern Atlantic Ocean. Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array are expected to result in the behavioral disturbance of some marine mammals. There is no evidence that the planned activities for which NSF and ASC seek the IHA could result in injury, serious injury, or mortality. The required mitigation and monitoring measures will minimize any potential risk for injury, serious injury, or mortality.

The following sections describe NSF and ASC's methods to estimate take by incidental harassment and present the applicant's estimates of the numbers of marine mammals that could be affected during the low-energy seismic survey in the Scotia Sea and southern Atlantic Ocean. The estimates are based on a consideration of the number of marine mammals that could be harassed during the approximately 325 hours and 2,950 km of seismic airgun operations with the two GI airgun array to be used.

During simultaneous operations of the airgun array and the other sound sources, any marine mammals close enough to be affected by the single and multi-beam echosounders, ADCP, or sub-bottom profiler will already be affected by the airguns. During times when the airguns are not operating, it is unlikely that marine mammals will exhibit more than minor, short-term responses to the echosounders, ADCPs, and sub-bottom profiler given their characteristics (e.g., narrow, downward-directed beam) and other considerations described previously in the notice of the proposed IHA (79 FR 45592, August 5, 2014). Such reactions are not considered to

constitute "taking" (NMFS, 2001). Therefore, for this activity, take was not authorized specifically for these sound sources beyond that which is already planned to be authorized for airguns.

There are no stock assessments and very limited population information available for marine mammals in the Scotia Sea and southern Atlantic Ocean. Published estimates of marine mammal densities are limited for the planned low-energy seismic survey's action area. Available density estimates from the Naval Marine Species Density Database (NMSDD) (NAVFAC, 2012) were used for 5 mysticetes and eight odontocetes. Density of spectacled porpoise was based on the density reported in Santora et al. (2009; as reported in NOAA SWFSC, 2013). Densities for minke (including the dwarf sub-species) whales and Subantarctic fur seals were unavailable and the densities for Antarctic minke whales and Antarctic fur seals were used as proxies, respectively.

For other mysticetes and odontocetes, reported sightings data from two previous research surveys in the Scotia Sea and vicinity were used to identify species that may be present in the planned action area and to estimate densities. While these surveys were not specifically designed to quantify marine mammal densities, there was sufficient information to develop density estimates. The data collected for the two studies were in terms of animals sighted per time unit, and the sighting data were then converted to an areal density (number of animals per square km) by multiplying the number of animals observed by the estimated area observed during the survey.

Some marine mammals that were present in the area may not have been observed. Southwell et al. (2008) suggested a 20 to 40% sighting factor for pinnipeds, and the most conservative value from Southwell et al. (2008) was applied for cetaceans. Therefore, the

estimated frequency of sightings data in the notice of the proposed IHA (79 FR 45592, August 5, 2014) and this IHA for cetaceans incorporates a correction factor of 5, which assumes only 20% of the animals present were reported due to sea and other environmental conditions that may have hindered observation, and therefore, there were 5 times more cetaceans actually present. The correction factor (20%) was intended to conservatively account for unobserved animals.

Sighting data collected during the 2003 RRS James Clark Ross Cruise JR82 (British Antarctic Survey, undated) were used as the basis to estimate densities for four species: southern right whale, southern bottlenose whale, hourglass dolphin, and Peale's dolphin. The cruise length was 4,143 km (2,237 nmi); however, lateral distance from the vessel where cetaceans were viewed was not identified in the report. Therefore, it was assumed that all species were sighted within 2.5 km (1.4 nmi) of the vessel (5 km [2.7 nmi] width) because this was the assumed sighting distance (half strip width). This resulted in a survey area of 20,715 km^2 (6,039 nmi^2). Density of the strap-toothed beaked whale was based on sighting data reported in Rossi-Santos et al. (2007). The survey length was 1,296 km (699.8 nmi); however, lateral distance from the vessel where cetaceans were sighted was not identified in the report. Therefore, it was assumed that all species were sighted within 2.5 km of the vessel (5 km width) because this was assumed as a conservative distance where cetaceans could be consistently observed. This width was needed to calculate densities from data sources where only cruise distance and animal numbers were available in the best available reports. This resulted in a survey area of 6,480 km^2 (1,889.3 nmi^2)

With respect to pinnipeds, one study (Santora et al., 2009 as reported in NOAA SWFSC, 2013) provided a density estimate for southern elephant seals. No other studies in the region of the Scotia Sea provided density estimates for pinnipeds. Therefore, reported sighting data from

two previous research surveys in the Scotia Sea and vicinity were used to identify species that may be present and to estimate densities. Sighting data collected during the 2003 RRS James Clark Ross Cruise JR82 (British Antarctic Survey, undated) were used as the basis to estimate densities for four species: Antarctic fur seal, crabeater seal, leopard seal, and Weddell seal. The survey length was 4,143 km (1,207.9 nmi); however, lateral distance from the vessel where pinnipeds were viewed was not identified in the report. Therefore, it was assumed that all species were sighted within 0.4 km (0.2 nmi) of the vessel (0.8 km [0.4 nmi] width), based on Southwell et al. (2008). This resulted in a survey area of 3,315 km^2 (966.5 nmi^2).

Some pinnipeds that were present in the area during the British Antarctic Survey cruise may not have been observed. Therefore, a correction factor of 1.66 was applied to the pinniped density estimates, which assumes 66% more animals than observed were present and potentially may have been in the water. This conservative correction factor takes into consideration that pinnipeds are relatively difficult to observe in the water due to their small body size and surface behavior, and some pinnipeds may not have been observed due to poor visibility conditions.

The pinnipeds that may be present in the study area during the planned action and are expected to be observed occur mostly near pack ice, coastal areas, and rocky habitats on the shelf, and are not prevalent in open sea areas where the low-energy seismic survey will be conducted. Because density estimates for pinnipeds in the sub-Antarctic and Antarctic regions typically represent individuals that have hauled-out of the water, those estimates are not necessarily representative of individuals that are in the water and could be potentially exposed to underwater sounds during the seismic airgun operations; therefore, the pinniped densities have been adjusted downward to account for this consideration. Take was not requested for Ross seals because preferred habitat for this species is not within the planned action area. Although

there is some uncertainty about the representativeness of the data and the assumptions used in the calculations below, the approach used here is believed to be the best available approach, using the best available science.

Table 5. Estimated densities and number of marine mammal species that might be exposed to greater than or equal to 160 dB (airgun operations) during NSF and ASC's low-energy seismic survey (approximately 2,950 km of tracklines/approximately 3,953 km^2 [0.67 km x 2 x 2,950 km] ensonified area for airgun operations) in the Scotia Sea and southern Atlantic Ocean, September to October 2014.

Species	Density (# of animals/km^2)[1]	Calculated Take from Seismic Airgun Operations (i.e., Estimated Number of Individuals Exposed to Sound Levels ≥ 160 dB re 1 µPa)[2]	Authorized Take	Abundance[3]	Approximate Percentage of Population Estimate (AuthorizedTake)[4]	Population Trend[5]
Mysticetes						
Southern right whale	0.0079652	31	31	8,000 to 15,000	0.39	Increasing at 7 to 8% per year
Humpback whale	0.0006610	3	3	35,000 to 40,000 – Worldwide 9,484 – Scotia Sea and Antarctica Peninsula	0.03	Increasing
Antarctic minke whale	0.1557920	616	616	Several 100,000 – Worldwide 18,125 – Scotia Sea and Antarctica Peninsula	3.4	Stable
Minke whale (including dwarf minke whale sub-species)	0.1557920	616	616	NA	NA	NA
Sei whale	0.0063590	25	25	80,000 - Worldwide	0.03	NA
Fin whale	0.0182040	72	72	140,000 – Worldwide	1.54	NA

				4,672 – Scotia Sea and Antarctica Peninsula		
Blue whale	0.0000510	1	1	8,000 to 9,000 - Worldwide	0.01	NA
Odontocetes						
Sperm whale	0.0020690	8	8	360,000 – Worldwide 9,500 - Antarctic	<0.01	NA
Arnoux's beaked whale	0.0113790	45	45	NA	NA	NA
Cuvier's beaked whale	0.000548	3	3	NA	NA	NA
Gray's beaked whale	0.0018850	7	7	NA	NA	NA
Shepherd's beaked whale	0.0092690	37	37	NA	NA	NA
Strap-toothed beaked whale	0.0007716	3	3	NA	NA	NA
Southern bottlenose whale	0.0089307	35	35	50,000 – South of Antarctic Convergence	0.07	NA
Killer whale	0.0153800	61	61	80,000 – South of Antarctic Convergence	0.08	NA
Long-finned pilot whale	0.2145570	848	848	200,000 – South of Antarctic Convergence	0.42	NA
Peale's dolphin	0.0026551	10	10	NA – Worldwide; 200 – southern Chile[3]	NA 5	NA
Hourglass dolphin	0.0154477	61	61	144,000	0.04	NA
Southern right whale dolphin	0.0061610	24	24	NA	NA	NA
Spectacled porpoise	0.0015000	6	6	NA	NA	NA
Pinnipeds						
Crabeater seal	0.0185313	73	73	5,000,000 to 15,000,000	<0.01	Increasing
Leopard seal	0.0115194	46	46	220,000 to 440,000	0.02	NA
Weddell	0.005129	20	20	500,000 to	<0.01	NA

seal				1,000,000		
Southern elephant seal	0.0003000	1	1	640,000 to 650,000 – Worldwide; 470,000 – South Georgia Island	<0.01	Increasing, decreasing, or stable depending on breeding population
Antarctic fur seal	0.5103608	2,017	2,017	1,600,000 to 3,000,000	0.13	Increasing
Subantarctic fur seal	0.5103608	2,017	2,017	>310,000	0.65	Increasing

NA = Not available or not assessed.

[1] Sightings from a 47 day (7,560 km) period on the RRS James Clark Ross JR82 survey during January to February 2003 and sightings from a 34 day (1,296 km) period on the Kotic II from January to March 2006.

[2] Calculated take is estimated density (reported density times correction factor) multiplied by the area ensonified to 160 dB (rms) around the planned seismic lines, increased by 25% for contingency.

[3] See population estimates for marine mammal species in Table 4 (above).

[4] Total authorized takes expressed as percentages of the species or regional populations.

[5] Jefferson et al. (2008).

Note: Take was not requested for Ross seals because preferred habitat for these species is not within the planned action area.

Numbers of marine mammals that might be present and potentially disturbed are estimated based on the available data about marine mammal distribution and densities in the planned Scotia Sea and southern Atlantic Ocean study area. NSF and ASC estimated the number of different individuals that may be exposed to airgun sounds with received levels greater than or equal to 160 dB re 1 μPa (rms) for seismic airgun operations on one or more occasions by considering the total marine area that would be within the 160 dB radius around the operating airgun array on at least one occasion and the expected density of marine mammals in the area (in the absence of the a seismic survey). The number of possible exposures can be estimated by considering the total marine area that would be within the 160 dB radius (the diameter is 670 m times 2) around the operating airguns. The 160 dB radii are based on acoustic modeling data for the airguns that may be used during the planned action (see Attachment B of the IHA application). As summarized in Table 3 (see Table 8 of the IHA application), the modeling results for the planned low-energy seismic airgun array indicate the received levels are dependent on water depth. Since the majority of the planned airgun operations will be conducted in waters greater than 1,000 m deep, the buffer zone of 670 m for the two 105 in^3 GI airguns was used.

The number of different individuals potentially exposed to received levels greater than or equal to 160 dB re 1 μPa (rms) from seismic airgun operations was calculated by multiplying:

(1) The expected species density (in number/km^2), times

(2) The anticipated area to be ensonified to that level during airgun operations.

Applying the approach described above, approximately 3,953 km^2 (including the 25% contingency) would be ensonified within the 160 dB isopleth for seismic airgun operations on one or more occasions during the planned survey. The take calculations within the study sites do

not explicitly add animals to account for the fact that new animals (i.e., turnover) not accounted for in the initial density snapshot could also approach and enter the area ensonified above 160 dB for seismic airgun operations. However, studies suggest that many marine mammals will avoid exposing themselves to sounds at this level, which suggests that there will not necessarily be a large number of new animals entering the area once the seismic survey started. Because this approach for calculating take estimates does not account for turnover in the marine mammal populations in the area during the course of the planned survey, the actual number of individuals exposed may be underestimated. However, any underestimation is likely offset by the conservative (i.e., probably overestimated) line-kilometer distances (including the 25% contingency) used to calculate the survey area, and the fact the approach assumes that no cetaceans or pinnipeds will move away or toward the tracklines as the Palmer approaches in response to increasing sound levels before the levels reach 160 dB for seismic airgun operations, which is likely to occur and which will decrease the density of marine mammals in the survey area. Another way of interpreting the estimates in Table 5 is that they represent the number of individuals that will be expected (in absence of a seismic program) to occur in the waters that will be exposed to greater than or equal to 160 dB (rms) for seismic airgun operations.

NSF and ASC's estimates of exposures to various sound levels assume that the planned seismic survey will be carried out in full; however, the ensonified areas calculated using the planned number of line-kilometers has been increased by 25% to accommodate lines that may need to be repeated, equipment testing, etc. As is typical during offshore ship surveys, inclement weather and equipment malfunctions will be likely to cause delays and may limit the number of useful line-kilometers of seismic operations that can be undertaken. The estimates of the numbers of marine mammals potentially exposed to 160 dB (rms) received levels are

precautionary and probably overestimate the actual numbers of marine mammals that could be involved. These estimates assume that there will be no weather, equipment, or mitigation delays that limit the seismic operations, which is highly unlikely.

Table 5 shows the estimates of the number of different individual marine mammals anticipated to be exposed to greater than or equal to 160 dB re 1 μPa (rms) for seismic airgun operations during the low-energy seismic survey if no animals moved away from the survey vessel. The total authorized take authorization is given in the middle column (fourth from the right) of Table 5.

Encouraging and Coordinating Research

NSF and ASC will coordinate the planned marine mammal monitoring program associated with the low-energy seismic survey with other parties that express interest in this activity and area. NSF and ASC will coordinate with applicable U.S. agencies (e.g., NMFS), and will comply with their requirements. NSF has already prepared a permit application for the Government of South Georgia and South Sandwich Islands for the planned research activities, including trawling and sampling of the seafloor. The action will complement fieldwork studying other Antarctic ice shelves, oceanographic studies, and ongoing development of ice sheet and other ocean models. It will facilitate learning at sea and ashore by students, help to fill important spatial and temporal gaps in a lightly sampled region of coastal Antarctica, provide additional data on marine mammals present in the Scotia Sea study areas, and communicate its findings via reports, publications, and public outreach.

Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

Section 101(a)(5)(D) of the MMPA also requires NMFS to determine that the authorization will not have an unmitigable adverse effect on the availability of marine mammal

species or stocks for subsistence use. There are no relevant subsistence uses of marine mammals implicated by this action (in the Scotia Sea and southern Atlantic Ocean study area). Therefore, NMFS has determined that the total taking of affected species or stocks will not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Analysis and Determinations

Negligible Impact

Negligible impact is "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival" (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (i.e., population-level effects). An estimate of the number of Level B harassment takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through behavioral harassment, NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.) and the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, effects on habitat, and the status of the species.

In making a negligible impact determination, NMFS evaluated factors such as:

(1) The number of anticipated serious injuries and or mortalities;

(2) The number and nature of anticipated injuries;

(3) The number, nature, intensity, and duration of takes by Level B harassment (all of

which are relatively limited in this case);

(4) The context in which the takes occur (e.g., impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data);

(5) The status of stock or species of marine mammals (i.e., depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population);

(6) Impacts on habitat affecting rates of recruitment/survival; and

(7) The effectiveness of monitoring and mitigation measures.

NMFS has determined that the specified activities associated with the marine seismic survey are not likely to cause PTS, or other non-auditory injury, serious injury, or death, based on the analysis above and the following factors:

(1) The likelihood that, given sufficient notice through relatively slow ship speed, marine mammals are expected to move away from a noise source that is annoying prior to its becoming potentially injurious;

(2) The availability of alternate areas of similar habitat value for marine mammals to temporarily vacate the survey area during the operation of the airgun(s) to avoid acoustic harassment;

(3) The potential for temporary or permanent hearing impairment is relatively low and would likely be avoided through the implementation of the required monitoring and mitigation measures (including shut-down measures); and

(4) The likelihood that marine mammal detection ability by trained PSOs is high at close proximity to the vessel.

No injuries, serious injuries, or mortalities are anticipated to occur as a result of NSF and

ASC's planned low-energy seismic survey, and none are authorized by NMFS. Table 5 of this document outlines the number of authorized Level B harassment takes that are anticipated as a result of these activities. Due to the nature, degree, and context of Level B (behavioral) harassment anticipated and described in this notice (see "Potential Effects on Marine Mammals" section above), the activity is not expected to impact rates of annual recruitment or survival for any affected species or stock, particularly given NMFS's and the applicant's planned mitigation, monitoring, and reporting measures to minimize impacts to marine mammals. Additionally, the seismic survey would not adversely impact marine mammal habitat.

For the marine mammal species that may occur within the action area, there are no known designated or important feeding and/or reproductive areas. Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (i.e., 24 hr cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall et al., 2007). While airgun operations are anticipated to occur on consecutive days, the estimated duration of the survey will not last more than a total of 30 days. Additionally, the seismic survey will be increasing sound levels in the marine environment in a relatively small area surrounding the vessel (compared to the range of the animals), which is constantly travelling over distances, so individual animals likely will only be exposed to and harassed by sound for less than a day.

As mentioned previously, NMFS estimates that 26 species of marine mammals under its jurisdiction could be potentially affected by Level B harassment over the course of the IHA. The population estimates for the marine mammal species that may be taken by Level B harassment were provided in Tables 2 and 5 of this document. As shown in those tables, the takes all

represent small proportions of the overall populations of these marine mammal species (i.e., all are less than or equal to 5%). No injury, serious injury, or mortality is expected to occur for any of these species, and due to the nature, degree, and context of the Level B harassment anticipated, the activity is not expected to impact rates of recruitment or survival for any of these marine mammal species.

Of the 26 marine mammal species under NMFS jurisdiction that may or are known to likely occur in the study area, six are listed as threatened or endangered under the ESA: southern right, humpback, sei, fin, blue, and sperm whales. These species are also considered depleted under the MMPA. None of the other marine mammal species that may be taken are listed as depleted under the MMPA. Of the ESA-listed species, incidental take has been authorized for all six species. To protect these animals (and other marine mammals in the study area), NSF and ASC will be required to cease airgun operations if any marine mammal enters designated exclusion zones. No injury, serious injury, or mortality is expected to occur for any of these species, and due to the nature, degree, and context of the Level B harassment anticipated, the activity is not expected to impact rates of recruitment or survival for any of these species.

NMFS's practice has been to apply the 160 dB re 1 μPa (rms) received level threshold for underwater impulse sound levels to determine whether take by Level B harassment occurs. Southall et al. (2007) provide a severity scale for ranking observed behavioral responses of both free-ranging marine mammals and laboratory subjects to various types of anthropogenic sound (see Table 4 in Southall et al. [2007]). NMFS has determined that, provided that the aforementioned mitigation and monitoring measures are implemented, the impact of conducting a low-energy marine seismic survey in the Scotia Sea and southern Atlantic Ocean, September to

October 2014, may result, at worst, in a modification in behavior and/or low-level physiological effects (Level B harassment) of certain species of marine mammals.

While behavioral modifications, including temporarily vacating the area during the operation of the airgun(s), may be made by these species to avoid the resultant acoustic disturbance, the availability of alternate areas for species to move to and the short and sporadic duration of the research activities have led NMFS to determine that the taking by Level B harassment from the specified activity will have a negligible impact on the affected species in the specified geographic region. Due to the nature, degree, and context of Level B (behavioral) harassment anticipated and described (see "Potential Effects on Marine Mammals" section above) in this notice, the activity is not expected to impact rates of annual recruitment or survival for any affected species or stock, particularly given the NMFS and applicant's plan to implement mitigation and monitoring measures will minimize impacts to marine mammals. Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the required monitoring and mitigation measures, NMFS finds that the total marine mammal take from NSF and ASC's low-energy seismic survey will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

As mentioned previously, NMFS estimates that 26 species of marine mammals under its jurisdiction could be potentially affected by Level B harassment over the course of the IHA. The population estimates for the marine mammal species that may be taken by Level B harassment were provided in Tables 2 and 5 of this document.

The estimated numbers of individual cetaceans and pinnipeds that could be exposed to seismic sounds with received levels greater than or equal to 160 dB re 1 μPa (rms) during the survey (including a 25% contingency) are in Table 5 of this document. Of the cetaceans, 31 southern right, 3 humpback, 616 Antarctic minke, 616 minke, 25 sei, 72 fin, 1 blue, and 8 sperm whales could be taken by Level B harassment during the planned seismic survey, which would represent 0.39, 0.03, 3.4, unknown, 0.03, 1.54, 0.1, and <0.01% of the affected worldwide or regional populations, respectively. In addition, 45 Arnoux's beaked, 3 Cuvier's beaked, 7 Gray's beaked, 37 Shepherd's beaked, 3 strap-toothed beaked, and 35 southern bottlenose whales could be taken be Level B harassment during the planned seismic survey, which would represent unknown, unknown, unknown, unknown, unknown, and 0.07% of the affected worldwide or regional populations, respectively. Of the delphinids, 61 killer whales, 848 long-finned pilot whales, and 10 Peale's, 61 hourglass, and 24 southern right whale dolphins, and 6 spectacled porpoise could be taken by Level B harassment during the planned seismic survey, which would represent 0.08, 0.42, unknown/5, 0.04, unknown, and unknown of the affected worldwide or regional populations, respectively. Of the pinnipeds, 73 crabeater, 46 leopard, 20 Weddell, and 1 southern elephant seals and 2,017 Antarctic and 2,017 Subantarctic fur seals could be taken by Level B harassment during the planned seismic survey, which would represent <0.01, 0.02, <0.01, <0.01, 0.13, and 0.65 of the affected worldwide or regional population, respectively.

No known current worldwide or regional population estimates are available for 9 species under NMFS's jurisdiction that could potentially be affected by Level B harassment over the course of the IHA. These species include the minke, Arnoux's beaked, Cuvier's beaked, Gray's beaked, Shepherd's beaked, and strap-toothed beaked whales, and Peale's and southern right whale dolphins and spectacled porpoises. Minke whales occur throughout the North Pacific

Ocean and North Atlantic Ocean and the dwarf sub-species occurs in the Southern Hemisphere (Jefferson et al., 2008). Arnoux's beaked whales have a vast circumpolar distribution in the deep, cold waters of the Southern Hemisphere generally southerly from 34º South. Cuvier's beaked whales generally occur in deep, offshore waters of tropical to polar regions worldwide. They seem to prefer waters over and near the continental slope (Jefferson et al., 2008). Gray's beaked whales are generally found in deep waters of temperate regions (south of 30º South) in the Southern Hemisphere (Jefferson et al., 2008). Shepherd's beaked whales are generally found in deep temperate waters (south of 30º South) of the Southern Hemisphere and are thought to have a circumpolar distribution (Jefferson et al., 2008). Strap-toothed beaked whales are generally found in deep temperate waters (between 35 to 60º South) of the Southern Hemisphere (Jefferson et al., 2008). Peale's dolphins generally occur in the waters around the southern tip of South America from 33 to 38º South, but may extend to islands further south. This species is considered coastal as they are commonly found in waters over the continental shelf (Jefferson et al., 2008). Southern right whale dolphins are generally found in temperate to subantarctic waters (30 to 65º South), with a southern limit bounded by the Antarctic Convergence (Jefferson et al., 2008). Spectacled porpoises are generally found in subantarctic waters and may have a circumpolar distribution in the Southern Hemisphere (as far south as 64º South). They have been sighted in oceanic waters, near islands, as well as in rivers and channels (Jefferson et al., 2008). Based on these distributions and preferences of these species, NMFS concludes that the authorized take of these species likely represent small numbers relative to the affected species' overall population sizes.

NMFS makes its small numbers determination based on the number of marine mammals that will be taken relative to the populations of the affected species or stocks. The authorized

take estimates all represent small numbers relative to the affected species or stock size (i.e., all are less than or equal to 5%). Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS finds that small numbers of marine mammals will be taken relative to the populations of the affected species or stocks. See Table 5 for the authorized take numbers of marine mammals.

Endangered Species Act

Of the species of marine mammals that may occur in the survey area, six are listed as endangered under the ESA: the southern right, humpback, sei, fin, blue, and sperm whales. Under section 7 of the ESA, NSF, on behalf of ASC and two other research institutions, initiated formal consultation with the NMFS, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on this low-energy seismic survey. NMFS's Office of Protected Resources, Permits and Conservation Division, initiated and engaged in formal consultation under section 7 of the ESA with NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. These two consultations were consolidated and addressed in a single Biological Opinion addressing the direct and indirect effects of these independent actions. In September 2014, NMFS issued a Biological Opinion that concluded that the action is not likely to jeopardize the continued existence of the six listed cetaceans that may occur in the survey area and included an Incidental Take Statement (ITS) incorporating the requirements of the IHA as Terms and Conditions of the ITS. Compliance with those Terms and Conditions is likewise a mandatory requirement of the IHA. The Biological Opinion also concluded that designated critical habitat of these species does not occur in the action area and

would not be affected by the survey.

National Environmental Policy Act

With NSF and ASC's complete IHA application, NSF and ASC provided NMFS an "Initial Environmental Evaluation/Environmental Assessment to Conduct a Study of the Role of the Central Scotia Sea and North Scotia Ridge in the Onset and Development of the Antarctic Circumpolar Current," (IEE/EA), prepared by AECOM on behalf of NSF and ASC. The IEE/EA analyzes the direct, indirect, and cumulative environmental impacts of the planned specified activities on marine mammals, including those listed as threatened or endangered under the ESA. NMFS , after review and evaluation of the NSF and ASC IEE/EA for consistency with the regulations published by the Council of Environmental Quality (CEQ) and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act, prepared an independent Environmental Assessment titled "Environmental Assessment on the Issuance of an Incidental Harassment Authorization to the National Science Foundation and Antarctic Support Contract to Take Marine Mammals by Harassment Incidental to a Low-Energy Marine Geophysical Survey in the Scotia Sea and South Atlantic Ocean, September to October 2014." NMFS has determined that the issuance of the IHA is not likely to result in significant impacts on the human environment and issued a Finding of No Significant Impact (FONSI).

Authorization

NMFS has issued an IHA to NSF and ASC for conducting a low-energy seismic survey in the Scotia Sea and southern Atlantic Ocean, incorporating the previously mentioned mitigation, monitoring, and reporting requirements.

Dated: October 2, 2014.

Perry F. Gayaldo,
Deputy Director,
Office of Protected Resources,
National Marine Fisheries Service.

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